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| 10/525,700 | 08/25/2005 | **Ralph Nonninger** | 3312 | 7653 |

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| EXAMINER | |
|---|---|
| RIVERA, JOSHEL | |

| ART UNIT | PAPER NUMBER |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/525,700 | NONNINGER, RALPH | |
| | Examiner | Art Unit | |
| | JOSHEL RIVERA | 1791 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *09 March 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-13,15 and 16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13,15 and 16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

1. Claims 1 – 13 and 15 – 16 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. With regards to claim 1, the claim states that "the metal *axial*, carbide, nitride or sulfide powder having a particle size of between 1 and 300 nm". It is unclear what *metal axial* is. Additionally there is insufficient antecedent basis for the limitation "the metal axial" in the claim. Claims 2 – 13 and 15 – 16 are also rejected due to their dependency to claim 1. For purpose of Examination the claim will be interpret to say *the metal oxide*.

3. With respect to claim 9, it reads "an extrusion mass is placed in a *special* container...". It is unclear what the applicant is trying to define as a *special* container. For purpose of examination the Examiner will take the position of treating the *special* container as any type of container.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 3, 4, 5, 6, 11, 15 and 16 are rejected 35 U.S.C. 103(a) as being unpatentable over Soria et al (FR 2776287 where US Patent 6,573,208 is used as an English translation) in view of Kolb et al (WO 01/30702).

6. With regards to claims 1 and 4, Soria teaches a method of manufacturing a porous ceramic material that is a hollow fiber (column 3 lines 9 – 11) by

a. preparing an organic paste comprising an inorganic portion or filler, an organic binder, a pore-forming agent and a solvent with a deflocculating agent and/or an inorganic binder and/or a processability enhancing agent (column 3 lines 27 – 32) where the inorganic portion or filler is a metallic compound either a non-oxide or oxide with a particle diameter preferably between 0.15 and 0.6 µm (150 nm and 600 nm making fillers of nanoscale) (column 3 lines 33 – 52), and the deflocculating agent can be a polyacrylic acid (column 6 lines 9 – 10) polyacrylic acid being a polymer of acrylic acid which is a carboxylic acid;

b. shaping the paste preferably by extrusion (column 4 lines 42 – 43) and

c. sintering the molded paste (column 4 lines 43 – 45).

7. Soria fails to explicitly disclose using an oxycarboxylic acid.

8. Kolb teaches a process of making zirconia sol (Abstract) where zirconium salt is mixed with 2-[2-(2-methoxyethoxy)ethoxy] acetic acid (page 2 lines 27 – 30, page 3 lines 21 – 22), where 2-[2-(2-methoxyethoxy)ethoxy] acetic acid is a synonym for 3,6,9-trioxadecanoic acid.

9. It would have been obvious to one of ordinary skills in the art at the time of the invention to have used an oxycarboxylic acid, as suggested by Kolb, in Soria's manufacturing method. The rationale being that, as stated by Kolb, these acids are used to function to prevent association like agglomeration and/or aggregation of particles as they are formed during hydrolysis reaction and ensures that the particles formed are non-associated (page 9 lines 10 – 16). This compound is also functional equivalent to the defloculant taught by Soria.

10. With regards to claim 3, the teachings of Soria and Kolb are presented above. Additionally Soria teaches that the metallic compound used as inorganic filler can be silicon carbide, silicon nitride, aluminum nitride, alumina, zirconium oxide or titanium oxide (column 3 lines 36 – 52).

With regards to claim 5, the teachings of Soria and Kolb are presented above. Soria teaches that the solvent used can be water (column 3 lines 66 – 67, column 4 lines 1 – 5).

11. With regards to claim 6, the teachings of Soria and Kolb are presented above. Soria teaches that the organic binder can be selected from cellulose and their

derivatives (column 3 lines 53 – 65). Example 2 further discloses polyvinyl alcohol and example 5 teaches polyacrylic acid.

12. With regards to claim 11, the teachings of Soria and Kolb are presented above. Additionally Soria states that the method can produce porous materials having an average pore diameter comprised between 0.5 and 2 μm (column 2 lines 60 – 62) and states that the pore diameter is dependent of the material used and firing temperature (column 1 lines 19 – 28).

13. With regards to claims 15 and 16, the teachings of Soria and Kolb are presented above. Additionally Soria states that his method is for making filtration members (column 1 lines 6 – 12) filtrations members having the shape of webs, where the ceramic is shaped before sintering (column 4 lines 42 – 43), where sintering is used to consolidate the shape (column 3 line 26), which would inherently indicate that the web made is capable of retaining its shape after sintering.

14. Claims 2, 8, 9 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soria et al (FR 2776287 where US Patent 6,573,208 is used as an English translation) in view of Kolb et al (WO 01/30702) as applied to claims 1, 3, 4, 5, 6, 11, 15 and 16 above, and further in view of Terpstra et al (US Patent 5,707,584).

15. With regards to claim 2, the teachings of Soria and Kolb are presented above. Soria teaches that the amount of the metallic compound (which would be the solid component of the ceramic mass) is between 50% and 85% by weight (column 3 lines 47

– 49). Soria and Kolb fail to teach that the amount of solid content is at least 20% by volume.

16. Terpstra teaches having a solid content of between 30 and 70% by volume (column 3 lines 14 – 16).

17. It would have been obvious to one of ordinary skills in the art at the time of the invention to have a solid content of at least 20% by volume, as suggested by Terpstra, in Soria's manufacturing method.

18. The rationale being that, as stated by Terpstra, by following the method described one would obtain a surface area/volume ratio relatively high which is vital in order for ceramic hollow fibers to compete with other types of membranes (column 1 lines 15 – 24). Additionally one of ordinary skills in the art would appreciate that by having a high content of solids in the ceramic mass would result in less material loss during the sintering process. Both disclosures teach method of making hollow fibers, therefore they are in the same field of endeavor.

19. With regards to claims 8 and 13, the teachings of Soria, Kolb and Terpstra are presented above. Soria and Kolb fail to disclose that the hollow fibers have an external diameter less than 500 μm.

20. Terpstra teaches a manufacturing method where the hollow fibers have an external diameter of less than 2000 μm and the minimum dimension is in the region of 500 μm (column 3 lines 53 – 55), where the final statement can be interpret that the minimum diameter possible that the fibers can have is between 450 μm up to 550 μm since the description in the prior art is broad. Additionally Terpstra states that it is well

known to produce hollow fibers with an outer diameter between 50 and 6000 μm and wall thickness of 20-300 microns (column 2 lines 56 – 58).

21. It would have been obvious to one of ordinary skills in the art at the time of the invention to produce hollow fibers with an external diameter of less than 500 μm, as suggested by Terpstra, in Soria's manufacturing method. The rationale being that, as stated by Terpstra, by following the method described one would obtain a surface are/volume ratio relatively high which is vital in order for ceramic hollow fibers to compete with other types of membranes (column 1 lines 15 – 24). Although not specifically mentioned, the dimensions provided by Terpstra disclose hollow fibers with dimensions that read on external diameter of 500 microns or less.

22. With regards to claim 9, the teachings of Soria, Kolb and Terpstra are presented above. Soria and Kolb fails to explicitly disclose that the ceramic mass that is to be extruded is placed in a special container or in a pressure vessel of a spinning device and conveyed through the device between room temperature and 300°C.

23. Terpstra teaches that the ceramic paste is spun in a spinneret (column 3 lines 2 – 4) and it can be seen in that the spinneret contains a container (Figure 1 item 3). Additionally Terpstra states using a temperature between 50° and 220°C (column 3 lines 12 – 13).

24. It would have been obvious to one of ordinary skills in the art at the time of the invention to place the ceramic mass in a container and convey the mass at a temperature between room temperature and 300°C, as suggested by Terpstra, in Soria's manufacturing method.

25. The rationale being that, first, one of ordinary skills in the art would appreciate that the spinning method requires for the material to be place in a container in order to obtain proper fibers without any concerns due to extenuating circumstances. Additionally, as stated by Terpstra, by having a container gas can be fed into a line which terminates centrally in the spinneret and ensures that the hollow fiber produced is held open and cooled (column 3 lines 4 – 8). The rationale to use the temperature described would have been, as stated by Terpstra, at the above temperature range the binder system becomes plastic which can help the mass during shaping and sintering (column 3 lines 12 – 14).

26. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Soria et al (FR 2776287 where US Patent 6,573,208 is used as an English translation) in view of Kolb et al (WO 01/30702) as applied to claims 1, 3, 4, 5, 6, 11, 15 and 16 above, and further in view of Tange et al (US Patent 5,082,607).

27. With regards to claim 7, the teachings of Soria and Kolb are presented above. Soria teaches that the binder can be a polyacrylic acid (column 3 lines 59 – 63). Soria and Kolb fail to describe that the binder is polymerized after shaping using a radical starter.

28. Tange teaches using a monofunctional unsaturated compound like methacrylate or acrylic acid (column 3 lines 8 – 29) and using a radical polymerization initiator (column 4 lines 54 – 59).

29. It would have been obvious to one of ordinary skills in the art at the time of the invention to use an acrylate and/or methacrylate which is polymerized after shaping by using a radical starter, as suggested by Tange, in Soria's manufacturing method. The rationale being that, as stated by Tange, by using a radical polymerizing compound the product becomes cured (column 4 lines 54 – 59) and since the solvent was dispersed uniformly once it is removed by evaporation and the cured product becomes porous (column 2 lines 52 – 61) allowing to control the porosity of the product (column 2 lines 15 – 23). Additionally, one of ordinary skill in the art, specifically polymerization processes would know that polymers such as acrylics can be polymerized in two ways. One is anionic polymerization and second is radical polymerization. Choosing one of the two methods would have been within knowledge of PHOSITA (Person Having Ordinary Skill In The Art).

30. Claims 10 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Soria et al (FR 2776287 where US Patent 6,573,208 is used as an English translation) in view of Kolb et al (WO 01/30702) as applied to claims 1, 3, 4, 5, 6, 11, 15 and 16 above, and further in view of Renlund et al (US Patent 4,571,414).

31. With regards to claim 10, the teachings of Soria and Kolb are presented above. Soria and Kolb fail to explicitly disclose that the densities of the hollow fibers after being sintered are greater than 97% of the theoretical density.

32. Renlund teaches an embodiment of a method of manufacturing ceramic hollow tube where, after sintering, the tubes had a density greater than 95% of the theoretical density (column 13 lines 57 – 67).

33. It would have been obvious to one of ordinary skills in the art at the time of the invention to have a sintered product with a density greater than 97% of the theoretical density, as suggested by Renlund, in Soria's manufacturing method. The rationale being that one of ordinary skills would appreciate that a lower density would indicate that material has been lost and, as stated by Renlund, one of the problems known has been that thermal decomposition of the binder from the shaped powder compact generally introduces defects such as cracks, pits and voids (column 1 lines 32 – 35) where having a higher density would indicate a lower porosity percentage and less defects on the sintered body (column 13 lines 63 – 67).

34. With regards to claim 12, the teachings of Soria, Kolb and Renlund are presented above. Additionally Soria teaches an embodiment where particles of active carbon are mixed in the ceramic paste in an amount of 7% by weight (column 6 lines 5 – 20). Soria and Kolb fail to explicitly disclose that the active carbon is in a form of a porous hollow fiber.

35. It would have been obvious to one of ordinary skills in the art at the time of the invention to have used porous hollow fiber active carbon in Soria's manufacturing method. The rationale being, as stated by Renlund, that the molded body is embedded in a supporting powder which prevents significant distortion of the body during baking (or sintering) to remove the binder and that the embedding powder should be chemically

compatible with the molded body (column 6 lines 40 – 46). Intrinsically by the active carbon being a porous hollow fiber the molded body can take the form of a hollow fiber and maintain this shape during the sintering process due to the active carbon.

***Response to Arguments***

36. Applicant's arguments filed March 9, 2010, with respect to the rejection(s) of claim(s) 1 under 35 USC 102(b) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Kolb et al (WO 01/30702) as explained above.

37. Additionally, regarding Applicant statement regarding the amendment, the amendment is in relation to the nanoscale powders having a particle size between 1 and 300 nm, where the Examiner clearly stated that the powders in Soria are between 150 nm and 600 nm (column 3 lines 33 – 52). The hollow fibers having a diameter less than 500 microns is not a limitation present in claim 1 but in claim 13.

38. Regarding the objections of claims 4 and 9 and the previous rejection under 35 USC 112 second paragraph of claims 5, 15 and 16, based on the amendment and arguments presented by the Applicant, the objections and rejections have been withdrawn.

## *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOSHEL RIVERA whose telephone number is (571) 270-7655. The examiner can normally be reached on Monday - Thursday 7:30am - 6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Katarzyna Wyrozebski can be reached on (571) 272-1127. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. R./
Examiner, Art Unit 1791

/KAT WYROZEBSKI/
Supervisory Patent Examiner, Art Unit 1791